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Quantitative Nanomechanical Testing in a TEM

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Recent progress in both *in situ* and *ex situ* small-scale mechanical testing methods has greatly improved our understanding of mechanical size effects in volumes from a few nanometers to a few microns. Besides the important results related to the effect of size on the strength of small structures, the ability to systematically measure the mechanical properties of small volumes through mechanical probing allows us to test samples that cannot easily be processed in bulk form, such as a specific grain boundary or a single crystal. In the case of individual nanostructures, the need to address the nanostructure in a direct manner is even more acute, and *in situ* TEM in many cases makes this possible. This talk will demonstrate how individual nanostructures and individual microstructural features can be tested quantitatively inside a TEM with different loading schemes such as indentation, compression, and tension. In addition, the promise of *in situ* nanomechanical testing in an aberration-free environment will also be addressed, with a discussion of the opportunities and challenges involving quantitative *in situ* mechanical testing at high resolution.